

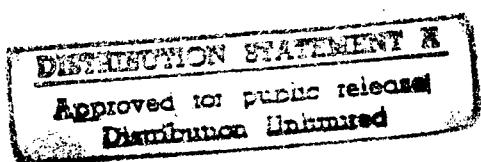
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SCIENTIFIC CONFERENCE ON ELECTRIC MEASURING INSTRUMENTS  
AND TECHNICAL MEANS OF AUTOMATION

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SCIENTIFIC CONFERENCE ON ELECTRIC MEASURING INSTRUMENTS  
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Izvestiya Vysshikh uchebnykh Zavedeniy--Priborostroyeniye  
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An inter-university scientific conference on electric measuring instruments and technical means of automation was held at the Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov (Lenin) from 11 through 15 November 1958.

Participating in the conference were scientists from the higher educational institutions, representatives of the institutes of the Academy of Sciences USSR, of the branch scientific research, industrial, design, and specialized organizations, representatives of the councils of the national economy. Guests from the People's Republics participated in the conference.

Thirty papers and reports were reported to the conference on the result of scientific-research and experimental-design works, carried out recently by the faculties and laboratories of the higher educational institutions, research laboratories, and branch organizations.

During the opening day of the conference papers were delivered by Dr. of Technical Sciences, Prof. N. N. Shumilovskiy (Moscow Order of Lenin Power Engineering Institute) "Principal Paths of the Development of Radioactive Methods of Automatic Control of Manufacturing Parameters", Dr. of Technical Sciences Prof. Ye. G. Shramkov, and scientific staff member of the Leningrad Polytechnic Institute imeni M. I. Kalinin (LPI), S. A. Spektor, "Measurements of Large Direct Currents by Methods of Nuclear Magnetic Resonance" and by Prof. M. A. Rozenblat (Institute of Automation and Telemechanics, Academy of Sciences USSR) "Application of Magnetic Amplifiers in Automation and Measuring Technology."

Prof. Shumilovskiy analyzed the processes that occur in radioactive methods of automatic control, and considered sources of measurement errors. In the conclusion of the paper, examples were given of the application of radioactive methods of automatic control of various manufacturing parameters.

S. A. Spektor dwelled on the so called "method of nuclear magnetic resonance." The new method of measuring dc exceeds the existing methods in measurement accuracy and at the same time simplifies considerably the measurement techniques.

On the basis of the results obtained on the investigation of the method there are being developed at the present time measuring apparatus intended for calibration and verification of dc transformers with a measurement limit up to 70,000 amperes. Further development of the method will lay the groundwork for automatization of the measurement process.

Prof. M. A. Rozenblat in his paper gave a survey of the development and progress in magnetic amplifiers. Their use in automation and measuring technology is increasing. Their speed, stability, and efficiency are being increased, their dimensions are being decreased, and their lower sensitivity limit is dropping. All this is accomplished by using new and better circuits, and also by using new magnetic materials and semiconductor elements. Particularly promising is the combined application of magnetic and semi-conducting amplifiers.

A paper "Modern Status and Prospects of Development of Theory and Technology of Automatic Control" was delivered by doctor of technical sciences, professor of the Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov (Lenin), A. V. Fateyev. He dwelled on the principal trends that prevail in the theory of automatic control and regulation and their use for the analysis and synthesis of automatic control systems.

Doctor of technical sciences, Prof. Ya. Z. Tsypkin (Institute of Automation and Telemechanics, Academy of Sciences USSR) delivered a paper "On Certain Features and Possibilities of Pulsed and Atomic Systems."

After analyzing the principal types of such systems, the lecturer dwelled on the question of quantization in time and its influence on the dynamic properties and interference immunity of the systems. He showed how to realize optimal processes in pulsed automatic systems; methods of "compensation" of delay in such systems. The lecturer reported on pulsed extremal and self-adapting systems and

showed the present day status of the theory of pulsed systems, and the principal trends in its development.

A paper "On Certain Trends in the Development of Mathematical Analog Computers and Computing Devices Intended for the Use in Industry" was delivered by the representative of the Scientific Research Institute for Computing Machinery Building, candidate of technical sciences V. Ye. Ushakov.

A paper "Discrete Automatic Systems with Inverse Feedback" was delivered by doctor of technical sciences, professor of the Leningrad Electrical Engineering Institute, N. G. Boldyrev. Dwelling in detail on the construction and operating principle of an automatic device, which, having  $m$  different states, can distinguish among  $N_m$  signals from the outside and work out  $mN_m$  different output reactions, the lecturer says that a finite automatic machine can always be synthesized of elements having two states "0" and "1", connected in a finite number of elementary "no", "and", and "or" circuits.

A communication was heard from the staff of the Siberian Physico-technical Research Institute, comrades B. S. Ryabyshkin and V. P. Filippov, "Analog Electronic Correlator." It is known that in questions involving study of winds in the ionosphere, tropospheric irregularities, etc. it is important to know correlation functions. In view of the cumbersomeness of the computations, it is preferable to create a special computing machine, which would perform all the computations automatically. The lecturers proposed an analog electronic correlator, developed and used for the International Geophysical Year by the Tomsk Ionospheric Station for the calculation of the correlation function in the study of winds in the ionosphere.

A paper on the subject of electric differentiation, smoothing, and averaging of time functions was delivered by candidate of technical sciences, lecturer in the Leningrad Electrical Engineering Institute, Ya. V. Novoseltsev.

A paper "Methods of Insuring Interference Immunity of Discrete Selective Systems" was delivered by candidate of technical sciences, lecturer at the Leningrad Electro-technical Institute, R. I. Yurgenson. In the paper are considered principles of insuring active and passive interference immunity of codes, used for the transmission of discrete data; methods used for this property, particularly various methods of detection and correction of errors, and also features in the construction of coding and decoding devices for codes intended for operation under conditions of pulse noise of varying intensity.

An interesting communication "On New Scaling Devices Using Polarized Relays" was delivered by representative of the Ural' Polytechnic Institute imeni S. M. Kirov, Comrade V. P. Skuridin.

A paper by doctor of technical sciences, Prof. A. V. Fremke and candidate of technical sciences, docent Ye. M. Dushin on the topic "Measuring Converters for Automatic Instruments with Discrete Form of Registration" was read by professor of Leningrad Electrical Engineering Institute, A. V. Fremke. Automatic instruments with discrete form of registration have a greater resolving ability (hundreds of measured quantities), speed, and possibility of comparing values of measured quantities with specified values, signalize the deviations of the values of the measured quantities from specified values. Combined operation of automatic instruments with discrete form of registration together with computing devices and actuating mechanisms gives promise of broadest application for automatization of control of various technological processes.

The devices that satisfy most completely the general requirements are static compensating converters, which permit the use of standard thermocouples, resistance thermometers, etc., as primary transducers. In accordance with the two types of primary converters -- generator and parametric -- two principal schemes of static compensation converters are possible.

In conclusion of this paper, Prof. A. V. Fremke dwelled on investigations on a static compensation converter of thermal emf into dc voltage (up to 25 volts) and a static compensation converter employing a Hall transducer for a resistance thermometer, carried out at the Electric-Measurements Laboratory of the Leningrad Electrical Engineering Institute.

A paper by candidate of technical sciences V. B. Ushakov and candidate of technical sciences P. N. Kopaygor "Computing Device for Automatic Centralized Control of Manufacturing Parameters" was delivered by staff member of the Scientific Research Institute for Computer Machine Building, Comrade V. B. Ushakov.

In modern manufacturing conditions, during the control of many technological parameters, the use of computing devices for automatic centralized control is quite effective. The lecturer considered in a paper the principal diagram and the technical data of one of such computing control devices.

A paper "Principal Questions of Automatic Electric-Measuring Instruments with Inverse Converters for the Measurement of Nonelectric Quantities" was delivered by

Assistant of the Leningrad Polytechnic Institute, Comrade M. M. Fetisov. These instruments operate on the principle of compensation of the measured quantity by means of another quantity, homogeneous with that measured. Participating in the process of compensation is an inverse converter, which develops a non electric quantity as a function of the electric quantity received by it.

Measuring instruments of this kind have found application in problems of measurements of mechanical, thermal, optical, and chemical quantities. They differ little in their structure from servomechanisms. Power amplifiers and converters are essential elements of such circuits. The use of so called "inertialess" converters in instruments with compensation of the measured non-electric quantity permits a great improvement in the dynamic properties of the instruments. An experimental investigation of such instruments has shown that in many cases it becomes possible to obtain very high accuracies at a very low sensitivity threshold.

A paper "On Certain Questions in the Construction of Automatic Dc Potentiometers of High Accuracy with Digital Output" was delivered by assistant Ye. I. Tenyakov (Novocherkassk Polytechnic Institute).

At the faculty of Automatic and Measuring Devices of the Novocherkassk Polytechnic Institute there have been developed several experimental models of automatic bridges with digital output and a measuring device for accurate automatic measuring instruments of comparison with digital output. Comrades Malov and Ivantsov expounded in detail in their communications on the operation of these automatic devices.

Doctor of technical sciences, professor of the Kuybyshev Industrial Institute imeni V. V. Kuybyshev (KII), L. F. Kulikovskiy, read a paper "Certain New Types of Alternating Current Compensators." In the paper notice is taken of new compensators, realized through the use of the method of oblique balance triangles for the balancing of the sought voltage vector. The vector is reckoned against a polar system of coordinates. The modulus and the phase of the vector are determined by calculation with the aid of simple formulas. The use of special compensating elements makes it possible to create automatic compensators for alternating current for discrete conversion and with digital output of the modulus and phase.

A paper "Apparatus for the Measurement of Parameters of Vibrations" was delivered by candidate of technical sciences, lecturer P. V. Novitskiy (LPI). The most promising for this purpose are piezoelectric accelerometers, the

errors of which on the whole is determined by the error of the converter, the noise level, and the errors in the amplifiers. In the design of converters use is made of the often verified experimental method of equivalent substitution, where the equivalent masses and compliances are determined for all the parts. A small vibration-converting apparatus was developed for test stands and for on-location tests.

A paper "Determination of Dynamic Errors of the Magneto-electric Oscilloscope by Means of Simulation" was delivered by doctor of technical sciences, professor at the Moscow Power Engineering Institute, R. R. Kharchenko.

It is generally known that the problem of determining the dynamic errors of magneto-electric oscilloscopes from the oscilloscope is very important in practice. Yet the corresponding analytic and graphical-analytic methods are complicated, laborious, and unreliable. In connection with the great progress in the technology of electric simulation, it is natural to turn to an electric model of an oscilloscope to obtain a better solution of this problem.

Many requirements were stated in the paper, which must be satisfied by an electric model of the oscilloscope vibrator. Such a model was found by Prof. Kharchenko and verified experimentally. The system permits a simulation of all five types of MPO-2 vibrators.

A paper "Measurements of Electric Quantities at Infra-Low Frequencies by Means of Indicating Electric Measuring Instruments of Various Systems" was delivered by candidate of technical sciences, lecturer of the Kiev Polytechnic Institute, P. P. Ornatskiy.

Recently industry and various research projects have employed infra-low frequencies on the order of 1.5 to 0.5 cycles. Ordinary reading instruments are not suitable for measurements of such frequencies. It became necessary to develop special instruments for the measurement of effective values infra-low frequencies. The lecturer analyzed the limiting frequency capabilities of instruments of various systems: instruments of the electro-mechanical group, instruments of the thermal group, detector instruments. Procedures are given for designing instruments of various systems for the indicated frequency range. In addition, he reported the development of various methods of measurement with the aid of special circuits.

Candidate of technical sciences, rector A. S. Rozenkrants (Ivanovo Power Engineering Institute imeni V. I. Lenin) reported "On Automatic Bridges and AC Compensators".

A communication "Certain Characteristic Miniature Induction Machines" was delivered by candidate of technical sciences, lecturer of the Kazan' Aviation Institute, L. I. Stolov. He examined the peculiarities of miniature induction machines with symmetrical windings. On the basis of the equations of the two-port network he investigates the mechanical and velocity characteristics of these miniature machines.

A communication on the topic "Instruments for Ultrasonic Control of Levels and Pressures of Liquids" was delivered by candidate of technical sciences, D. A. Borodayev (Ural' Polytechnic Institute imeni S. M. Kirov).

The large scale hydraulic engineering construction has urged the problem of improvement and development of new types of apparatus for automatic control of levels and pressures in hydroelectric power stations, in locks of ship canals and in irrigation systems. Recently new contactless methods of measurements have found application in level control: radioactive and acoustic. These methods make it possible to simplify the apparatus, to broaden the range of measured quantities, and to increase the measurement accuracy.

Comrades Yu. A. Skripnik and N. F. Suvid of the Kiev Polytechnic Institute have made two interesting communications. The first related "On a Commutation Phase-Sensitive Indicator of Semi-Equilibrium of AC Bridges," and the second "On Meters with Magnetic Bridges."

The communication "High-Sensitivity Magnetic Gas Analyzers for Oxygen" was delivered by senior instructor of the KAI, V. A. Ferenets. He examined a method of increasing the sensitivity of magnetic gas analyzers with oxygen, the action of which is based on the use of the phenomena of thermomagnetic and natural thermal convection.

An interesting paper was delivered by professor of the Leningrad Electrical Engineering Institute, V. V. Pasynkov. He considered the application of semiconductors in measuring technology and dwelled in particular detail on the technology of the manufacture of nonlinear semiconducting resistances, developed at the faculty of dielectrics and semiconductors of the Leningrad Electrotchenic Institute, and on their characteristics and practical utilization. The possible field of application of nonlinear semiconductor resistances is very broad. The variety of physical properties of semiconducting materials, a further improvement of the quality, all insure broad utilization of semiconductors in almost all branches of the national economy, particularly in radioelectronics, measuring technology, and automation.

The lecturer devoted special attention to nonlinear semiconductor devices designed for power ratings from one to ten or fifteen watts and showed examples of their practical application.

A paper "Transistorized Measuring Amplifiers" was delivered by assistant of the Leningrad Polytechnic Institute, G. N. Novopashennyy. He described a simplified method of design of semiconductor amplifiers and, on the basis of research carried out at the laboratory for physico-technical measurements of the Leningrad Polytechnic Institute, made recommendations on the use of transistors in measuring amplifiers, and also on the problem of methods of constructing circuits for such amplifiers.

The paper of candidate of technical sciences, docent Ya. V. Novosel'tsev, assistants Ye. Ye. Afanas'yev, N. A. Smirnov, and Ye. P. Uglyumov "Semiconductor Precision Frequency Meter Employing the Methods of Pulse Counting" was delivered by assistant N. A. Smirnov.

A report was also heard from candidate of technical sciences P. G. Nikitin and from the senior instructor of the Ural' Polytechnic Institute imeni S. M. Kirov, D. A. Bezukladnikov on the topic "Measurements of the Intensity of the Magnetic Field when Using Bismuth Resistances and Transducers based on the "all Effect."

In the assembly hall of the Leningrad Electrical Engineering Institute, where the conference was held, an exhibit was organized of new developments and samples of certain instruments.

At the conclusion of the session a resolution was adopted, summarizing the results of the work of the conference. It noted the tremendous upsurge in the economic potential of the country and the fast rate of increase of labor productivity and introduction of new technology in all the most important branches of the national economy, given in the theses of N. S. Khrushchev on control figures for 1959--1965. The Soviet technical higher educational institutions play a very important role in the preparation of scientific cadres and carrying out further scientific-research work.

The resolution noted the need for a regular gathering of similar inter-university conferences which should be held in accordance with the more specialized problems such as the following: need for expanding the work on automatization and a greater scope and aggressiveness in the introduction of new accomplishments of science and technology into manufacturing. It is recommended that the Council for the National Economy organize several experimental plants,

equipped with automatic control instruments and means of computational technology.

The resolution also noted the need of organizing in the 1959--1960 school year inter-university student conferences on automation and electric measuring technology. A motion was adopted regarding the need for calling a special conference on instruments with digital output. It was resolved to ask the Minister of Higher Education USSR that there be organized in the higher educational institutions faculties or divisions for the preparation of specialists in the field of computing technology. The conference pointed out the basic trend in further research on electric measuring instruments and technical means of automation for their introduction to the national economy of the country.

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